

Proposal to modernise the Methodology of Teaching, Assessment/ Examination

ETO - STCW III/6 CoC	Name of respondent, organisation, and role:		
Competency/ Module: Transformers			
Knowledge, understanding and proficiency	Recommendation of working group regarding the outcome and objective.	Rationale	Action required
Outcome 1: Explain the construction characteristics of transformers	Keep	Relevant	None
1.1 Transformer core and shell construction	Keep	Relevant	None
1.2 B/H curves	Keep	Relevant	None
1.3 Eddy current losses within the core	Keep	Relevant	None
1.4 Applied voltage and induced voltage	Keep	Relevant	None
1.5 Production of harmonics	Keep	Relevant	None
1.6 Instrument Transformers	Add	Suggestion from industry consultation that ETOs need the knowledge of the principles of working with Instrument transformers such as CT & PT.	Add this outcome.
Outcome 2: Analyse the operation of single-phase transformers on load	Keep	Relevant	None
2.1 Full transformer equivalent circuit and simplified equivalent circuit	Keep	Relevant	None
2.2 Calculation of equivalent resistance and reactance	Keep	Relevant	None
2.3 Open and short circuit tests	Keep	Relevant	None
2.4 Calculation of the transformer efficiency for full load, half load and different power factors	Keep	Relevant	None
2.5 Voltage regulation	Modernise	Required for newer types of vessels, which use electric propulsion or some variable drives.	Include Variable Frequency Drives.

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2.6 Parallel operation of single-phase transformers	Modernise	This installation is rarely seen on modern vessels.	Only teach to a basic level.
Outcome 3: Analyse the operation of three phase transformers	Keep	Relevant	None
3.1 Transformer winding connections, vector diagrams, vector symbols and phase displacements	Keep	Relevant	None
3.2 Conditions for parallel operation of three phase transformers	Keep	Relevant	None
3.3 Tap changing	Modernise	Contextualise to show practical application that will be carried out on board.	Include practical exercises in the teaching of this outcome.
3.4 Transformer cooling classifications	Keep	Relevant	None
Outcome 4: Explain transformer protection	Keep	Relevant	None
4.1 Effects of short circuit faults	Keep	Relevant	None
4.2 Gas-Oil actuated (Buchholz) relay	Keep	Relevant	None
4.3 circuit breakers	Keep	Relevant	None
4.4 Surge protection	Keep	Relevant	None
4.5 Means of transformer protection against overcurrent and earth fault, including the use of different types of relays	Add	ETOs need to know the different protection systems on transformers.	Add this outcome
Proposal submitted by:	Any other outcomes for this competency, above and beyond STCW which would be needed due to use of modern technology and impact of future fuels onboard:		
	Objective	Reason Why	Action required
Cadet Training & Modernisation Working Group	Include Human Element Factors throughout the syllabus	To provide seafarers with a contextualised understanding of the Human Element in the maritime industry, showing how they can put theory into practice in the work they carry out at sea.	Raise awareness throughout the Cadet's training of the areas in which human element factors will have an impact. Recommendations on where this can be included have been noted throughout the

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			entire syllabus. Not every template has Human Element Factor recommendations but please do add any you feel may have been missed.
Cadet Training & Modernisation Working Group	Include Data Science skills throughout the syllabus	Data Science Skills (Comprehension, Analysis, Presentation, etc...) are already required within much of the syllabus. A further, specific focus on these skills needs to be taught where relevant.	A specific topic will need to be introduced to improve Cadets' Data Science skills. Practical application of data science skills should be highlighted throughout the syllabus. Not every template has Data Science recommendations but please do add any you feel may have been missed.
Cadet Training & Modernisation Working Group	Ensure all outcomes are contextualised to help Cadets understand what they are learning in relation to what they will experience at sea.	While some outcomes are intrinsically linked to work carried out at sea, some need to be contextualised to show how they apply to work on board. Where this is the case, it is important to make sure Cadets clearly understand how the outcome relates to work at sea and it is essential to make sure that this context is given with reference to current and future seagoing technologies and practices.	Where outcomes do not specifically cover a topic which relates to work carried out at sea, more must be done to contextualise the outcome and make it relevant to the maritime industry, giving specific shipping examples of how the outcome may be applied in a modern shipping context. Not every template has contextualisation recommendations but please do add any you feel may have been missed.